

WHAT IS CLAIMED IS:

1. A high frequency wave glass antenna for an automobile, comprising a primary antenna conductor, a grounding conductor, a power feeding point for the 5 primary antenna conductor and a grounded point for the grounding conductor provided on or in a glass sheet of a window of an automobile;

wherein the power feeding point and the grounded point are provided so as to be located in the vicinity of 10 a peripheral portion of the glass sheet or an opening edge formed in an automobile body;

wherein when seen from an interior side or an exterior side of the automobile, the primary antenna conductor extends in a counterclockwise direction, 15 beginning at the power feeding point;

wherein two portions of the primary antenna conductor are connected by a loop-forming conductor to form a loop conductor by the primary antenna conductor and the loop-forming conductor, or a portion of the primary antenna 20 conductor and the power feeding point are connected by a loop-forming conductor to form a loop conductor by the primary antenna conductor, the loop-forming conductor and the power feeding point; and

wherein a portion or an entire portion of the 25 grounding conductor is located near to and capacitively coupled with at least one of the primary antenna conductor, the loop-forming conductor and the power

feeding point.

2. A high frequency wave glass antenna for an automobile, comprising a primary antenna conductor, a grounding conductor, a power feeding point for the 5 primary antenna conductor and a grounded point for the grounding conductor provided on or in a glass sheet of a window of an automobile;

wherein the power feeding point and the grounded point are provided so as to be located in the vicinity of 10 a peripheral portion of the glass sheet or an opening edge formed in an automobile body;

wherein when seen from an interior side or an exterior side of the automobile, the primary antenna conductor extends in a counterclockwise direction, 15 beginning at the power feeding point;

wherein two portions of the primary antenna conductor are connected by a first loop-forming conductor to form a loop conductor by the primary antenna conductor and the first loop-forming conductor, or a portion of the 20 primary antenna conductor and the power feeding point are connected by a first loop-forming conductor to form a first loop conductor by the primary antenna conductor, the first loop-forming conductor and the power feeding point;

25 wherein two portions of the primary antenna conductor, which are not contained in the first loop conductor, are connected by a second loop-forming

conductor to form a second loop conductor by the primary antenna conductor and the second loop-forming conductor; and

wherein a portion or an entire portion of the
5 grounding conductor is located near to and capacitively coupled with at least one of the primary antenna conductor, the first loop-forming conductor, the second loop-forming conductor and the power feeding point.

3. A high frequency wave glass antenna for an
10 automobile, comprising a primary antenna conductor, a grounding conductor, a power feeding point for the primary antenna conductor and a grounded point for the grounding conductor provided on or in a glass sheet of a window of an automobile;

15 wherein the power feeding point and the grounded point are provided so as to be located in the vicinity of a peripheral portion of the glass sheet or an opening edge formed in an automobile body;

wherein when seen from an interior side or an
20 exterior side of the automobile, the primary antenna conductor is provided so as to extend, in a counterclockwise direction, to at least a lower side of the glass sheet substantially along the peripheral portion of the glass sheet or the opening edge, beginning
25 at the power feeding point;

wherein two portions of the primary antenna conductor are connected by a loop-forming conductor to

form a loop conductor by the primary antenna conductor and the loop-forming conductor, or a portion of the primary antenna conductor and the power feeding point are connected by a loop-forming conductor to form a loop

5 conductor by the primary antenna conductor, the loop-forming conductor and the power feeding point; and

wherein a portion or an entire portion of the grounding conductor, which extends beginning at the grounded point, is located near to and capacitively

10 coupled with at least one of a lower portion of the primary antenna conductor and the loop-forming conductor.

4. The glass antenna according to Claim 1, wherein the loop-forming conductor is provided at a position, which is higher than a substantial center of the glass sheet in

15 a vertical direction.

5. The glass antenna according to Claim 1, wherein when the glass sheet is divided into three parts with equal intervals L in a vertical direction, and when the three parts are called an A region, a B region and a C region

20 from top, the loop-forming conductor is not provided in the B region.

6. The glass antenna according to Claim 3, wherein when the glass sheet is divided into three parts with equal intervals L in a vertical direction, and when the three parts are called an A region, a B region and a C region

25 from top, the loop-forming conductor is not provided in the B region.

7. The glass antenna according to Claim 2, wherein the power feeding point is provided higher than a substantial center of the glass sheet in a vertical direction; wherein when seen from the interior side or the exterior 5 side of the automobile, the primary antenna conductor is provided so as to extend, in the counterclockwise direction, to at least a lower side of the glass sheet substantially along the peripheral portion of the glass sheet or the opening edge, beginning at the power feeding 10 point;

wherein the two portions of the primary antenna conductor that are connected by the first loop-forming conductor are located higher than the substantial center of the glass sheet in the vertical direction, or the 15 portion of the primary antenna conductor that is connected to the power feeding point by the first loop-forming conductor is provided higher than the substantial center of the glass sheet in the vertical direction;

wherein the two portions of the primary antenna conductor that are not contained in the first loop conductor and that are located lower than the substantial center of the glass sheet in the vertical direction are connected by the second loop-forming conductor; and

wherein a portion or an entire portion of the 25 grounding conductor, which extends beginning at the grounded point, is located near to and capacitively coupled with at least one of a lower portion of the

primary antenna conductor, the first loop-forming conductor and the second loop-forming conductor.

8. The glass antenna according to Claim 2, wherein when the glass sheet is divided into three parts with equal 5 intervals L in a vertical direction, and when the three parts are called an A region, a B region and a C region from top, none of the first loop-forming conductor and the second loop-forming conductor are provided in the B region.

10 9. The glass antenna according to Claim 8, wherein when the glass sheet is divided into the three parts with equal intervals L in the vertical direction, and when the three parts are called the A region, the B region and the C region from top, the first loop-forming conductor is 15 entirely provided in the A region, and the second loop-forming conductor is entirely provided in the C region.

10. The glass antenna according to Claim 1, wherein the loop conductor has a plurality portions connected by a single auxiliary loop-forming conductor or a plurality of 20 auxiliary loop-forming conductors.

11. The glass antenna according to Claim 2, wherein the first loop conductor has a plurality portions connected by a single auxiliary loop-forming conductor or a plurality of auxiliary loop-forming conductors.

25 12. The glass antenna according to Claim 2, wherein the second loop conductor has a plurality portions connected by a single auxiliary loop-forming conductor or a

plurality of auxiliary loop-forming conductors.

13. The glass antenna according to Claim 1, wherein when seen from the interior side or the exterior side, the power feeding point and the grounded point are located in
5 the vicinity of a right edge or an upper edge of the glass sheet, and the grounded point is located substantially under the power feeding point.

14. The glass antenna according to Claim 1, wherein the loop-forming conductor is located at a position nearer to
10 a center on the glass sheet than a portion of the primary antenna that forms the loop conductor.

15. The glass antenna according to Claim 1, wherein the loop-forming conductor is located at a position nearer to the peripheral portion of the glass sheet than a portion
15 of the primary antenna that forms the loop conductor.

16. The glass antenna according to Claim 1, wherein the distance between a portion or an entire portion of the grounding conductor and a portion or an entire portion of the primary antenna conductor is set at 0.5 to 8.0 mm to
20 capacitively couple the grounding conductor and the primary antenna conductor.

17. The glass antenna according to Claim 2, wherein the distance between a portion or an entire portion of the grounding conductor and a portion or an entire portion of the second loop-forming conductor is set at 0.5 to 8.0 mm
25 to capacitively couple the grounding conductor and the second loop-forming conductor.

18. The glass antenna according to Claim 2, wherein the primary antenna conductor has a conductor length between the first loop conductor and the second loop conductor ranging from $(1/4) \cdot (\lambda_M/4) \times K$ to $(1/2) \cdot (\lambda_M/4) \times K$, wherein
5 a desired frequency band to be received has a center frequency F_M , the center frequency has a wavelength λ_M , and K is shortening ratio by glass.
19. The glass antenna according to Claim 1, wherein the grounding conductor extends in a clockwise direction,
10 beginning at the grounded point.
20. The glass antenna according to Claim 2, wherein the grounding conductor extends in a clockwise direction,
beginning at the grounded point.